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ORIGINAL PAPER

The spatial range of local governments: does geographical distance affect governance and public service?

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Abstract Does space matter for local governments in the implementation of development policies? Geographical distance is believed to weaken the transmission of the socioeconomic development policy. Peripherally located local governments may be weaker than those centrally located local governments. Polish local governments from 1995–2007 were assessed based on performance indicators. The results show that the effective range of regional centres is limited to adjacent municipalities within a distance of 25 km and other local governments should be considered as having peripheral significance.

JEL Classification R53 · H77 · H11

1 Introduction

The territorial administration reform of 1999 in Poland changed the institutional and spatial regime for self-governments in Poland. The strategic objective[1] of the reform was to create strong NUTS2 regions (voivodeships, *województwa*), that could become partners for other European regions (Kaczmarek 2005). The administrative change

[1] Other goals were to adjust the public statistics system to the EUROSTAT reporting requirements and to break up with the socialist regime.

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included the replacement of 49 small voivodeships[2] and their regional governments with 16 NUTS2 units with new regional authorities. NUTS4 / LAU1[3] districts (*powiat*), the level of administration which had existed prior to 1975, were reintroduced to play the role of intermediary government between the NUTS5 / LAU2 municipality level (*gmina*) and NUTS2 voivodeship level. This decentralisation institutional reform was made to strengthen bottom-up governance and to weaken the role of central government in resolving everyday social problems (Kulesza 1993 and 2002). After this reform, NUTS5 level authorities, the local ones, are expected to be financially independent units and responsible for running a sustainable development policy, which consists therefore of attracting new funds (i.e. from public grants, investors, taxes) and spending it on community service (i.e. infrastructure, education, health care) and development investments. NUTS2 authorities, the regional ones, are responsible i.e. for supporting regional economy, creating entrepreneurship and innovative milieu and provision of public goods and services on regional scale, which are always located in some of NUTS5 units. NUTS2 investments and actions are to solve over local issues, within their regional policy or postulated by local NUTS4 and NUTS5 units. Also, spatial and sectoral distribution of NUTS2 funds follows the revealed by local units development problems. The assumption of the reform was that new voivodeships, with a stronger financial and organisational capacity, would stimulate weaker local authorities within their respective operating areas. The reform and financial support from EU funds were supposed to be a remedy to the country's spatial diversity. The first perceptible effect of the reform was the change in the spatial relations between the self-government authorities. Primarily, both the geographical and the institutional distance between municipalities and voivodeship capitals increased.

Much research has been carried out with respect to the functioning and effectiveness of the provision of public goods by local and regional self-governments (e.g. Keating 1995; Newton 1982). Usually, however, studies focus on the concerns of ongoing administration in the existing institutional settings. Ten years after the reform, the collected data enable the analysis of institutional changes alone, and the determination whether the new administrative structure is more effective than the former one in terms of promoting sustainable development. The Polish reform focused on reducing public expenditure and improving public service delivery (Manning and Parison 2003). The reform assumed that a diffusion mechanism would occur—stronger regions would enhance weaker regions. The decentralisation was to be reinforced by the policy of investing in the "drivers"—the richest cities, which were to push forward the development of weaker areas. The implementation of those mechanisms was strictly related with the public sector, its tasks, competencies, capabilities, budget, etc. The establishment of a hierarchical self-government formed the basis for those processes, where functions were assigned to each level, individual or overlapping in terms of their scope, but not in terms of the territory covered. A question arises whether the

[2] They corresponded to NUTS3 level. However, before the 1999 reform, the NUTS classification was not used in Poland. At present, there are no administrative authorities at the NUTS1 (region) and NUTS3 (subregion) levels.

[3] In 2003 NUTS regulation changed NUTS4 into LAU1 and NUTS5 into LAU2, however, both names are still used in literature (e.g. ESPON 2009)

established institutions, which form the framework for the functioning of local governments, were designed in such a way as to improve the effectiveness of the provision of public goods and the transmission of policy that promotes socioeconomic development. Institutional rent is an important concept in the study, and it is understood as the proximity of regional authorities with significant competence. In particular, this refers to a financial power of NUTS2 authorities. The administrative reform has deprived many voivodeship capitals of their status and thus has increased the distance between a substantial part of municipalities and regional centres. Due to the institutional transition which changed the relative location of municipalities, many of them became peripheral. This applies mostly to weaker local governments, which were adjoined to a stronger core.

The objective of the study is to determine to what extent the detrimental change, i.e. the increased average geographical distance between municipalities and voivodeship capitals, became a discriminating factor in the developmental regional policy implemented by local governments. The thread of the argument was based on the hypotheses that geographical distance weakens the top-down transmission of the socioeconomic development policy, and that peripherally located local governments are weaker than those centrally located. Consequently, the spatial effective range of regional centres, i.e. voivodeship capitals, is insufficient. Therefore, the local government reform has enhanced the significance of the institutional rent to local development, which leads to a stronger diversification at the regional level.

2 The spatial performance of the public sector

Space is important in at least two aspects of governance: the provision of public goods and services and the transmission of regional and local policy. In both mechanisms, one can observe geographical aspects, which when included in the analysis, may change non-spatial solutions and the equilibrium state.

First, in the provision of public goods and services, the spatial factor is involved in decisions to locate hospitals, schools, leisure infrastructure, roads etc. and designate catchment areas for i.e. schools and public offices. Space is significant for the performance of public responsibilities (Oakerson 1992). The local governments' performance must be efficient: the supply of public goods should meet the demand, economies of scale must exist and policy must correspond to the heterogeneous preferences of the local communities (Hooghe and Marks 2009). For community satisfaction, high accessibility (service available quicker than maximum travel time threshold), low congestion and high efficiency (maximum public service capacity to given spending) are required. Local governments restrict the provision of public goods to their respective areas because of strong autonomy, overall competition and lack of cooperation among territorial units. This mechanism is especially noticeable when the provision of those goods generates a positive spatial external effect taken over by the communities of other local governments, without any costs of participation on their side. A spatial external effect[4] of a good or service is understood as the part of supply that may

[4] External effects are spatially limited (Hanink 2006).

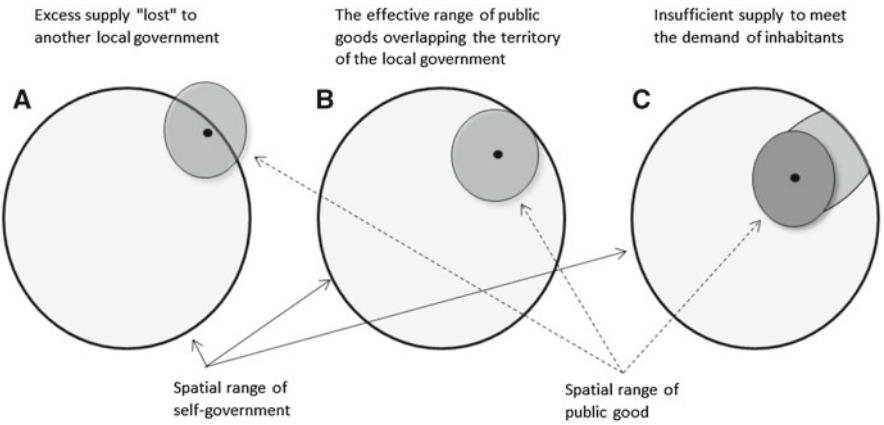

Fig. 1 Effective location of public goods

be taken over by the inhabitants of other local entity because of its spatial range. A neighbouring local government can act as a free rider. When no financial cooperation exists, public good or service is financed from taxes and funds of one community and used for free (as it is public good) by the other community members. Additionally, relative overcrowding and queueing appears when scale of facility was planned for one community and becomes used by neighbours. From the perspective of an individual local government, the effective location of a community or urban infrastructure, enabling the provision of public goods, is closer to the centre, so that the effective range is equal to or smaller than the respective territory (see Fig. 1b, c). This location naturally limits the usage of facility by other communities as it extends travel time from neighbouring administrative units. Such behaviour is contrary to the postulate of global effectiveness; however, in micro-scale, it is reasonable.

An example to illustrate the model of effective location (see Fig. 1a) is the construction of a hospital on the border of a voivodeship. The effective range of the institution would reach beyond the administrative borders, thus generating spatial external effects and reducing the effectiveness of the local government. Faced with the choice of having a zone without influence or reaching beyond the borders of the voivodeship, authorities will be enticed by the former scenario (see Fig. 1b, c), which may result in the shortage of public goods and services. Local authorities opt to locate the public infrastructure (like a hospital) at the centre of the voivodeship, thus limiting the access of inhabitants in the border municipalities. However, when a public infrastructure may have negative effects, the reverse is true. For instance, in landfill services, local governments do not have any incentive to internalise the negative social and environmental effects. Thus, such operations will be located at the border of the area of the local government.

The problem of dividing space and providing public goods by local governments can be compared with other spatial problems of designing optimal and useful catchment areas. This is true in the localisation of post offices (Kenny 2005), primary and secondary schools (Borland and Howsen 1992; Sutcliffe and Board 1986), hospitals and health facilities (Church et al. 1995; Khan et al. 2001; Guagliardo 2004,) etc. Usually, too small catchment area is the source of inefficiency, evokes the problems with

providing many specialty services, but in terms of society allows for better control and transparency, direct democracy, etc. Meanwhile, catchment areas which are too big can cause overcrowding, leading to higher costs in access, less democracy and transparency for society and possible diseconomies of scale may cause many processes to be uneconomical. The problem of regional and local governments is analogous, but includes competencies issue. A local government like NUTS5 municipality may be too small to operate effectively and to promote sustainable growth. NUTS4 districts, the intermediary level, although better suited in terms of "size", do not have the necessary competencies, as their statutory responsibilities are of a different nature than those of municipalities, while NUTS2 voivodeships are too large and the cost of scale increases. In theory, decentralisation enables the adjustment of the provision of public goods to heterogeneous social preferences. However, there is a trade-off between cost-effectiveness and maximisation of social utility.

The spatial range of local governments applies also to the effects of the socioeconomic policy. Here, a spatial scale exists as well, being a consequence of the administrative and territorial division (Spicer 2006). The vertical hierarchy and the size of the local government, which involve division of competencies and diverse impact, are the foundation of an effectively diversified range of policy. Within hierarchical administrative structures, the intermediary level is the source of unreliability. In this intermediation, extent and range are of great importance. NUTS2 voivodeship authorities forward programmes of action to NUTS4 district authorities because these are more suitable in terms of geography and competencies than the municipalities. It can be modelled as "signal transmission". The transmission mechanisms should work both top-down and bottom-up. Districts as intermediary are expected to demonstrate initiative to integrate the municipalities and to transmit the "signal" between municipalities and the voivodeship authorities. At this stage, a particularly significant question arises–do the NUTS4 districts enhance or weaken the signal, when transmitting it to the NUTS5 municipalities? As a transmitter, the districts ought to augment the transmission to reach each municipality, even the most remote ones. If, however, the district weakens the signal, it is likely that the signal will not reach the municipality level. It means that the municipalities would not fully implement the voivodeship policy.

Policy transmission can be treated as a stream of tacit knowledge. The circulation between heterogeneous actors is strictly dependent on the distance, both geographical as well as cultural and social. The more remote the authorities are, the weaker the flow of knowledge and the more difficult their interaction is with the centre (Dicken 2007).[5] The significance of spatial concentration in the learning process is understood as the ability to develop new ways of acting, skills, networks of social interrelations, etc. (Lundvall and Johnson 1994). In addition, learning requires interaction and combining knowledge and information from many sources. Those mechanisms benefit from proximity.

What affects the strength of signal transmission by districts? In addition to the distance factor, there are at least more factors: the competencies and the cooperation

[5] Concept started by Tobler (1970), developed in quantitative distance-decay models (Fotheringham and O'Kelly 1989). Currently socioeconomic patterns which are homogenous over space sometimes are rarely assumed in the literature.

network. Competencies are understood as the general influential power of district authorities. It consists of the legal capacity, budget and governance. Limited competencies are restrictive. The cooperation network of municipalities within a district is significant. The district needs to make more efforts to reach an individual, non-cooperating municipality than to transmit the same signal to a network of interrelated municipalities. Thus, geographical distance matters. The effective range of voivodeship authorities does not need to cover the entire territory of the voivodeship, owing to transmissions at the level of the district. However, when districts fail to duly meet their responsibilities, the influence of voivodeship may not go beyond the district level. Thus, policy signals are better received by the municipalities and districts located near the voivodeship entities.

The implementation of policy is founded on two groups of actions. Primarily, direct financial transfer, usually by central or regional authorities, (partly) contributes to the budgets of local governments. The effective range here is basically unlimited, and the implementation is instant. However, in management activities, spatial proximity is critical. The decision on public investment relies on information and social interactions (i.e. negotiations, appropriateness of action). Large administrative units have to overcome the geographical distance from their local entities. Regional authorities may not have the accurate information and appreciation for the local situation which may lead to weak decisions. Moreover, geographical distance and population potential may make the operational management of a large unit more difficult than that of a small entity.

The core–periphery model offers another explanation as to how remote local governments can be weaker. When spatial distribution of economic activity is not equalised over space, often centripetal forces attract resources from the periphery to the core. The absence of cooperation between the central cities and the surrounding municipalities, with their relations being based on competition, exacerbates the economic differences between the areas (Kopczewska 2009). Divergence is a natural process, like the fact that only the fittest survives in nature.

Institutional rent is a consequence of the core–periphery model. Voivodeship capitals, as strong regional centres, attract business and new inhabitants, while municipalities where no administrative authorities are located are less attractive in terms of investments, living, culture, etc. Municipalities adjacent to the centre benefit from the institutional rent. Their location is often the only source of comparative advantage over other municipalities, similar but peripheral. On the other hand, the spatial distribution of economic and social activity or of regional welfare is of great importance. When large voivodeships are an effect of an administrative marriage between weak and strong units, strong municipalities are usually located in the centre, and the weaker adjoined municipalities are located in the periphery, as the objective of the reform was to join development drivers with the peripheries. Therefore, remote municipalities are naturally weaker. Such an administrative reform deteriorates their relative location, which does not provide any developmental incentive but rather consolidates their developmental stage.

Provision of public goods and services in core–periphery model has also cost-efficiency dimension. Due to economies of scale, supporting communities in low-density areas with all necessary local public services are more costly than in urbanised

areas. Studies on urban sprawl (Carruthers and Ulfarsson 2003; Hortas-Rico and Sole-Olle 2010) prove that public services, which provision cost is distance-dependent (infrastructure and community facility i.e. street cleaning, trash collection, public transport), meet raising costs by ca. 2–7 % in low-density areas, assuming the same quality and quantity as in cities. Thus, implications in core–periphery model are serious. Peripheral local governments spending less per capita should suffer from double negative effect: lower per capita expenditures and higher provision cost should result in reduced quality and quantity of public goods and services provided.

3 Space transformation by the administrative reform

There is a broad literature on the Polish territorial administration reform of 1999, its preparation, implementation, expected outcome, new institutional settings, etc. (e.g. Kulesza 2002; Kaczmarek 2005). The most important change in the Polish administration reform of 1999 consisted in the relocation of regional centres–voivodeship capitals. The elimination of the majority of voivodeship capitals caused the NUTS2 territories to grow (three- to sixfold) and thus increased the distance in the core–periphery relation (see Table 1). In the previous system, the average distance between a municipality and the central city within a voivodeship ranged from ~17 km to ~46 km, whereas the maximum distance (the voivodeship span) ranged from 28 to 143 km. Under the existing administrative division, the average distance from a municipality to a voivodeship capital is within a range of 30–80 km, and the most peripheral municipalities are at an average distance of 121 km (between 69 and 179 km) (see Fig. 2). Due to the reform, nearly 60 % of municipalities (1,500 units) moved away from their central city (on average about 46 km, half of about 42 km, up to 156 km), and only 6 % (150 units) gained closer proximity to their central city (by an average of 12 km, half of about 10 km). Before the reform, 18 % of municipalities were located more than 50 km from the centre, then after 1999 this number rose to 58 %. The establishment of district levels, which is closer to the municipalities than to the former voivodeship capitals, has brought the municipalities nearer the centres of power, albeit with less competence. Spatial accessibility has been defined as road distance not longer than 60–90 min (Cinnamon et al. 2008; ESPON 2007) for access to palliative care or transportation to the airport in terms of the territorial cohesion. While Euclidean distance is constant over time, the road distance and travel time depend on the road network, quality, capacity, etc. In Polish conditions, the following approximations are proposed 1 km Euclidean distance = 1.2 km road distance and the 1 km road distance = 1.06 min travel time.[6] Thus, a travel time of 90 min corresponds to the Euclidean distance of 70 km. In the new administrative system, up to 800 municipalities (32 %) are located more than 70 km Euclidean distance. This means that these areas are not accessible from the core city in less than 90 min by car. Results for local governments would be even worse, especially if the public mode of transportation (bus or train) were taken

[6] For a random sample of 100 municipalities within 50, 100 and 150 km from the central city a road distance and an estimated travel time were calculated. Web-map www.zumi.pl was used. Results are at regression coefficients with significance level less than 0.00001.

Table 1 The size of local governments before and after the 1999 reform

Voivodeship	New division		Old division	
	16 NUTS2 units		49 NUTS3-like units	
	Min	Max	Min	Max
Area (km^2)	9,412	35,557	1,523	12,327
Number of municipalities in voivodeships	71	314	20	150
Average distance between municipality and voivodeship capital (km)	30	80	17.5	46.4
Max. distance between municipality and voivodeship capital (km)	69	179	28	143
Number of districts (NUTS4)	12	42	–	–
Inhabitants (2006) (in thousands)	171.7	5,008	249.7	3,918.4
Inhabitants per municipality (in thousands)	10.14	28.13	–	–
Inhabitants in voivodeship capital (in thousands)	86	1,702	11.89	1,635
Density of population (persons/km^2)	59.03	378.56	46.46	729.61

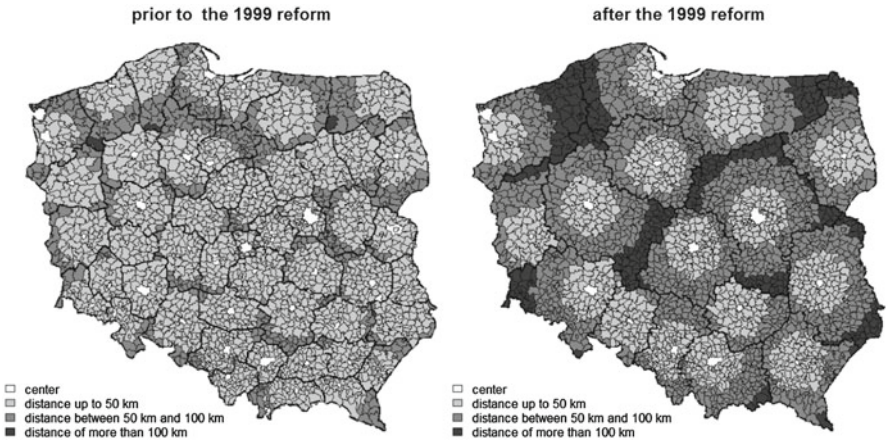

Fig. 2 Distance between municipalities and voivodeship capitals prior to and after the 1999 reform

into account.[7] The obtained results of multiplier for road distance on the basis of great circle are similar to estimations by Tobler (1993).

The 1999 administration reform redistributed the responsibilities and competencies between the local and regional levels of authority. The philosophy of power separation results in the catalogue of responsibilities, obligations, rights, etc. It can be assumed that the responsibility of voivodeship authorities is to develop long-term regional

[7] Research on a spatial availability of the nearest secondary school shows the average time of getting to school at 8 am by bus is 56 min, for 60 % locations is more than 45 min and for 10 % locations is more than 120 min (Guzik 2003).

development strategies. Activity profiles, priority actions, essential investments, etc. are defined for the entire voivodeship. Thus, the voivodeship authorities set the general direction of changes and the support framework. NUTS5/LAU2 municipalities are in charge of most of the ongoing activity, which should be carried out in such a way as to provide public goods and services that are best suited to the needs and preferences of the inhabitants. Investments or future-oriented activities are supposed to be in line with the voivodeship strategy. Districts are responsible for ongoing activities, mostly local, but of an intermunicipality character, such as intermunicipality infrastructure, the labour market, and security and defence. According to the assumptions of the administrative reform, NUTS2 voivodeships are supposed to be strong bodies. At present, they concentrate populations from 1 to 5 million.[8] This equals the population of many European countries such as Estonia, Slovenia, Lithuania, Latvia, Ireland, Croatia or Norway, which gives the voivodeship the potential to play a significant role in the international market. NUTS4/LAU1 districts cannot be more than local centres, in many cases without any chance to become the real core, due to their location and territories, hierarchy and competences. They do not exceed a population of 150,000 people, with a population of 100,000 on average.

Institutional reform was a necessity to break with the communist order—the central control, in which regional authorities have only been a transmission belt for the central decisions. In the new order, NUTS5 became a basic element of democratisation process, taking into account all the consequences (Grochowski 1997). Democracy is equated with independence, both financial and in the decision-making. The current division of responsibilities implies a natural cooperation between municipal, district and voivodeship authorities. The voivodeship government identifies the strategic path for the future and undertakes the provision of the needs of its districts and municipalities. Efficient local authorities use their freedom to work towards development, while weaker local units expect regional government assistance. The crucial point is whether voivodeship authorities appreciate the problems in the remote localities. The voivodeship may be too large to manage the uniform development of its peripheries. This is the problem of institutional design and creation transparent mechanism of intergovernmental relationships.

4 Spatial and institutional factors versus the performance of local governments

This empirical study aims to determine how the increasing distance between NUTS2 and NUTS5 level and relative peripheralization of local governments affect the performance of local governments and the implementation of a sustainable socioeconomic policy. On the basis of the available financial and development indicators for 1995–2007, a cross-section time-series analysis at the NUTS5 level was performed. Distances between municipalities and their respective voivodeship capitals were

[8] The population of "old" voivodeships ranged between 300,000 and 4 million, but most of them did not exceed a population of a million.

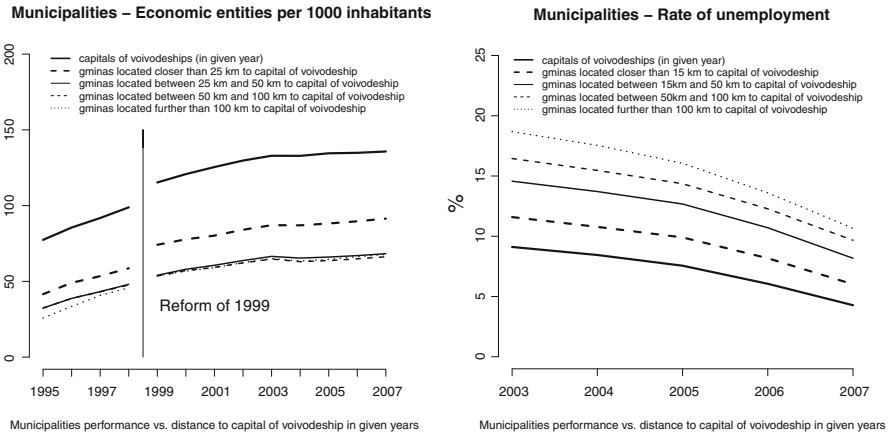

Fig. 3 Socio-economic performance of municipalities according to the distance to centres of power

calculated for both administrative divisions.[9] Development trends were compared for municipalities, which include: the voivodeship capitals and the municipalities located at a distance of less than 25, 25–50 km, 50–100 km and more than 100 km (see Figs. 3 and 4). The groups of municipalities located at a certain distance before and after the reform are not composed of the same municipalities. Therefore, statistical bias occurs, and shifts in trends are possible. Before 1999, only four of ca. 2500 municipalities were located at a distance of more than 100 km from the voivodeship capitals. After the reform, the sample of voivodeship capitals was substantially reduced and ca. 11 % was located farther than 100 km from the central city.

The effective transmission of regional policy to the local level should equalise socioeconomic development parameters in terms of per capita values. This should be reflected in similar patterns of municipality development, irrespective of location, and in the balancing of the structure and magnitude of municipality budgets, both in terms of revenues and expenditures. The investigation of the effective range of a regional government is to answer the question: "Does the performance of the remote municipalities significantly differ from that of central municipalities?". The distribution of the municipalities at specific distances from the centre (see Table 2) clearly indicates that the prevailing distance after 1999 reform shifted from the 25–50 km interval to 50–100 km.

First of all, substantial inequalities can be seen in the labour market (see Fig. 3a, b). Business is clearly concentrated in the voivodeship capitals (approximately 130 entities per 1,000 inhabitants), and for municipalities located at a distance of more than 25 km, the level is about 50 % of the voivodeship average. The unemployment rate is the most sensitive indicator of the influence of distance. In the municipalities located at a distance of more than 100 km, the unemployment rate since 2003 has been

[9] The Euclidean distance was calculated between the centroids of figures representing the municipalities. Transport distances and travel time distances would give more detailed information on spatial separation, however, this kind of matrix is not available and multiplier approximation used in this study gives the reliable results.

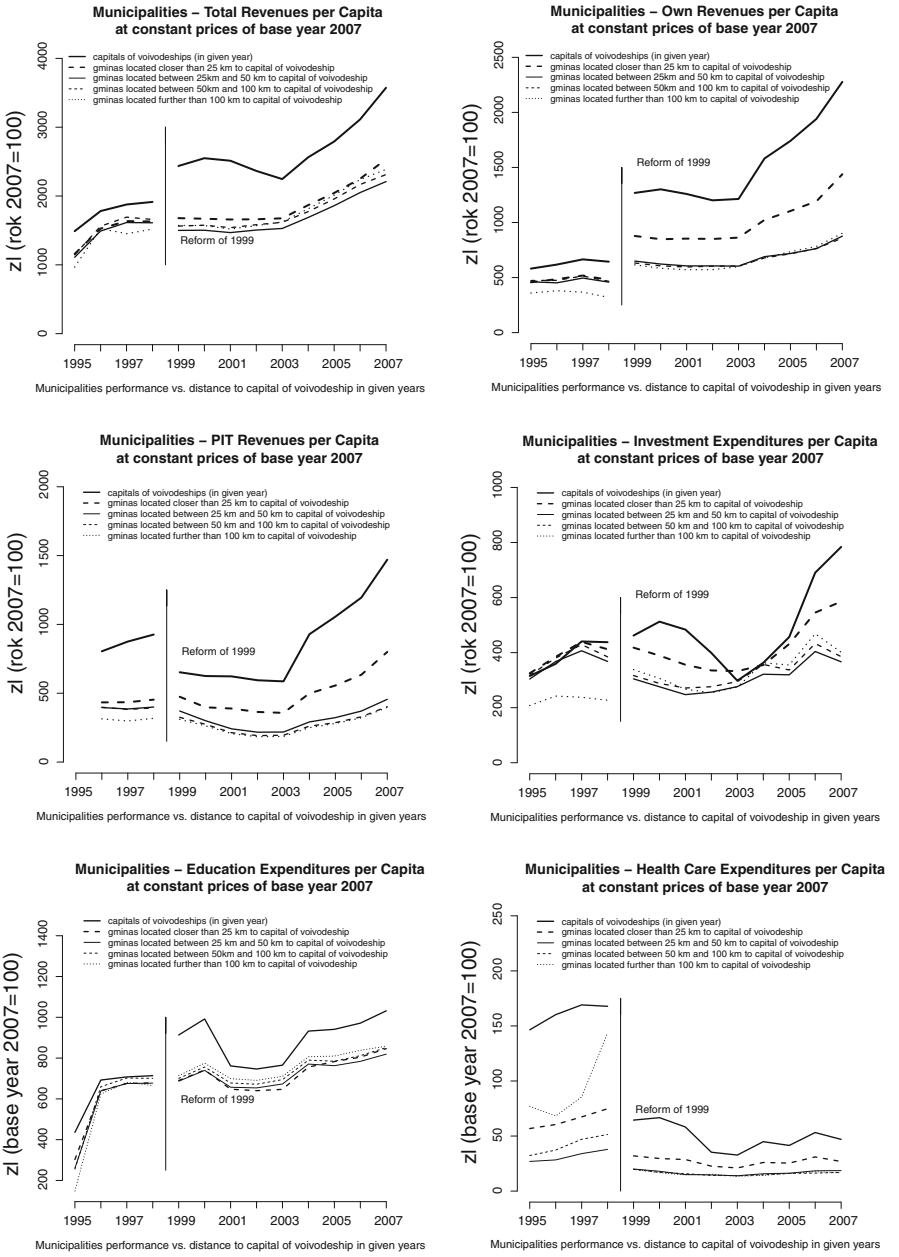

Fig. 4 Financial performance of municipalities according to the distance to centres of power

consistently doubled that of the voivodeship capital rate. In 2007, on average, for each subsequent distance interval (which in approx. is 60 min. travel time), unemployment rate was 1.5 percentage points higher; in 2003 (when the general unemployment rate was higher), the difference was 2–2.5 percentage points. The farther the locality was

Table 2 Number of municipalities within a distance of 15, 50 and 100 km from their respective voivodeship capitals

Administrative division	Voivodeship capital	Distance to voivodeship			
		<25 km	25–50 km	50–100 km	>100 km
Old division	49	293	1,694	431	4
New division	16	92	917	1,168	266

from the centre, the more difficult the labour market. The composition of working females and males is heterogeneous over space. In remote municipalities, there are more than 1.2 employed women per employed man. An opposite phenomenon can be seen in the municipalities adjacent to voivodeship towns, with approximately 7 % less women than men among the employed. This may be attributed to two phenomena: the inability of men to work and the discrimination against women. These are the statistics for 80 % of employees—in the industry (3.1 mln people) and services (5.2 mln people), without agriculture (2.1 mln people). In the data, there is a problem of small sample, because the economic activity rate of people in working age (17–65) fluctuates around 18–20 % in the municipalities and ca.54 % in core cities (data for 2007). Those data reflect the transmission (or rather the absence thereof) of the labour market policy and is a low attractiveness index of peripheral municipalities. In spite of the fact that the number of firms *per capita* is not related to location (except for the centre), the labour markets of the most remote municipalities demonstrate a high unemployment rate and a high percentage of women in the employed population.

The analysis implies (see Fig. 4a–f) that distance is correlated with funding for the municipalities. The periods before and after the reform are not fully comparable, as the principles of financing have changed for local government. Government expenditures in GDP increased from 5.8 % in 1991 up to 12.6 % in 2001 and 11.5 % in 2008. From a cross-cutting perspective, the revenues and expenditures of municipalities per capita for each year are substantially higher in voivodeship capitals. In 2007, the per capita total revenues of local governments located just 25 km away from the centre were approximately 25 % lower than in the voivodeship capitals, and 35 % lower in municipalities located more than 25 km away. Own revenues of the other municipalities were even worse in comparison with voivodeship capitals: 27 % lower in radius of 25 km and 60 % lower in farther locations. Also, the PIT (*personal income tax*) revenues account only for 60 % of the voivodeship capital level within a distance of 25 km, and nearly 30 % at a distance of more than 25 km.[10] The investment expenditures of the municipalities located at a distance of more than 25 km from the centre are similar and account for approximately 50 % of the investment expenditures of voivodeship capitals.

According to expectations, core units spend and earn more per capita. However, the impact of the centre dies out in the 25-km range. Units located farther run the

[10] Statistics are biased due to "farmers' effect" i.e. farmers are not covered by PIT as a group with a traditionally lower income. The number of farmers increases with distance to the centre. Therefore, the effect of decreased PIT revenue is doubled (lower income of population and lower number of taxpayers).

same budget policy, which is much weaker than that in the centre and below national average. The periphery is the area located at a distance of more than 25 km from the voivodeship capital. Therefore, there is no spatial differentiation in the activities of the local governments, but only the institutional effect can be seen. The size of the voivodeship does not affect the municipality budgets. Non-core municipalities act in a similar way across the entire territory. However, the substantial difference between those municipalities and the centres is puzzling—this reflects regional divergence without any diffusion. Voivodeship capitals are development drivers, generating substantially higher revenues and expenditures. However, they do not stimulate the other municipalities. The municipalities located closer than 25 km from the town are usually the "bedroom suburbs", performing auxiliary functions to the core. They benefit from the geographical and institutional rent, albeit only a moderate one.

Also, the inequalities in welfare, including kindergartens, health care, housing and education policy, are likewise apparent. The farther a municipality is from the centre, the fewer children (as a population percentage) attend kindergartens. This is due both to the scarcity of kindergartens, which are governed by local self-governments, and to the ageing population as a result of the migration of people to big cities. The process of ageing is visible on the entire territory. In 10 years (1997–2007), the ratio of older people to young people has increased by 20 p.p. from 0.58 to 0.78. This process seems to be stronger in core cities; however, this effect may be challenged statistically: many people living in the city rent flats without being registered.[11] Also, residential development proves that attractive locations are in the range of 25 km. Taking the real estate market as indicator of the attractiveness and the shift in 1999 in trend of the number of dwellings, one can see that cities, which lost their status of voivodeship capital, were not an attractive area for investment—both private and corporate. In 1999, government carried out reforms of education and health service, primarily by changing the rules of financing and control. The shifts in public spending became visible. Spatial cross section proves that peripheries are under-financed, thus providing lower quality public services.

The statistical results presented above can be confirmed by spatial econometric modelling. Localisation, defined as distance to regional centre, impacts the behaviour of territorial units. As the NUTS5 units performance changes are explained with the distance, the spatial interactions model was chosen (Fotheringham and O'Kelly 1989). Three modifications of the basic model were introduced: firstly, instead of two-way flows, one-way flows were applied because the purpose of modelling is to capture policy flows from NUTS2 to NUTS5 units only. Secondly, polynomial specification instead of commonly used exponential and power functional forms was chosen (Taylor 1975). Thirdly, the spatial autocorrelation component was included in the error term, so the spatial error model instead of traditional model was estimated. NUTS5 units are connected neighbours because of joint adherence to hierarchically higher administration NUTS4 units. Those modifications significantly improved the estimation results.

[11] In Poland, there is an obligation to have a registered address of permanent residence and people are usually registered in their own property, even when living and working in other city. This register is the basis of population statistics.

In the model, the relative revenues or expenditures *per capita* at 2007 prices given as national average = 100 % for 2007 (*xx1*) were explained by analogous variable from 1999 (*xx0*), fourth-order polynomial Euclidean distance (DIST) between NUTS2 and NUTS5 ($DIST^1$, $DIST^2$, $DIST^3$ and $DIST^4$) and control variable CITY, which is a dummy variable for NUTS5 units, which are the locations of NUTS4 authorities. The relative change in "ranking" (level above/below the average) after the reform of 1999 should result from geographical proximity to the centre, starting point and institutional rent. It was expected that a given starting point increase in distance should lower the ranking position, while having a the seat of government NUTS4 (dummy = 1) should increase the rankings as a result of institutional rent. The estimated spatial error model is as follows:

$$xx1 = \beta_0 + \beta_1 \cdot xx0 + \beta_2 \cdot \text{city} + \gamma_1 \cdot \text{DIST} + \gamma_2 \cdot \text{DIST}^2 + \gamma_3 \cdot \text{DIST}^3 + \gamma_4 \cdot \text{DIST}^4 + e$$

and $e = \lambda We + u$.

The spatial error model was applied, so that filtering shocks in policy transmission to the lowest NUTS5 level were possible. Spatial weight matrix W was assumed as row-standardised contiguity matrix of 2,471 units, with no islands in the sample. This kind of nonlinear modelling is also used in spatial interpolation. In the estimated polynomial regression, the same problems as those seen in trend surface analysis occur (Legendre and Legendre 1998): strong impact of extreme values on estimation results and edge effect, where polynomial functions take unrealistic values for high values of explanatory variable (distance). In this model, estimates above 150 km are unreliable because of the small number of NUTS5 units that are of great distance from their centre (Table 3).

The obtained results seem very promising. Approximately all polynomial functions for six dependent variables cross the line $y = 1$ at distance (x) of 25 km (see Fig. 5). This means that, on average, local government units located closer than 25 km from voivodeship city perform their budgets above national average. This implies the existence of strong centripetal forces, which can cause regional divergence inside NUTS2 units. A status of "periphery" is assigned to units located farther than 25 km. With this distance, diffusion impact expires. Institutional rent cannot be unequivocally defined– the dummy variable CITY coefficient is almost always significant, but the sign is changeable. The spatial coefficient λ is always significant, relatively high and positive, and Akaike information criterion is almost always better for spatial specification what confirms the need for using a spatial error model.

5 Conclusions

The goal of this study was to determine whether regional and local governments, despite varying locations relative to the centre, implement a balanced socioeconomic policy. The distance from the centre NUTS2 voivodeship capital was proven to be important to the performance of NUTS5 municipalities. After the 1999 administration reform, which assumed the establishment of large and strong regions (voivodeships),

Table 3 Estimation results for the spatial error model

Variable	Total revenues	Own revenues	PIT revenues	Investment expenditures	Education expenditures	Health care expenditures
Intercept	4.3e−01***	7.5e−01***	7.2e−01***	7.3e−01***	6.2e−01***	8.4e−01**
X0	7.1e−01***	8.2e−01***	1.1e−00***	7.7e−01***	4.7e−01***	5.1e−01***
CITY	−2.1e−02*	1.6e−01***	2.7e−01***	9.9e−02	−3.9e−02***	2.7e−01**
DIST	−9.4e−03***	−3.2e−02***	−4.9e−02***	−3.1e−02*	−7.5e−02**	−1.5e−02
DIST2	1.9e−04***	5.2e−04***	8.9e−04***	6.6e−04*	1.7e−04**	2.1e−04
DIST3	−1.5e−06**	−3.3e−06**	−6.3e−06***	−5.6e−06*	−1.6e−06**	−1.5e−06
DIST4	4.4e−09**	7.6e−09*	1.5e−08***	1.7e−08	4.6e−09**	4.4e−09
Lambda	0.275***	0.338***	0.577***	0.137***	0.265***	0.144***
ML Sigma^2	0.030	0.134	0.085	1.165	0.031	2.132
Akaike (spatial)	−1,579.6	2,117.1	1,129.7	7,427.4	−1,543.1	8,925.1
Akaike (linear)	−1,500.3	2,233.9	1,554.8	7,446.1	−1,457.9	8,944

Legend: significance notation: 0.1, * 0.05, ** 0.01, *** 0.001

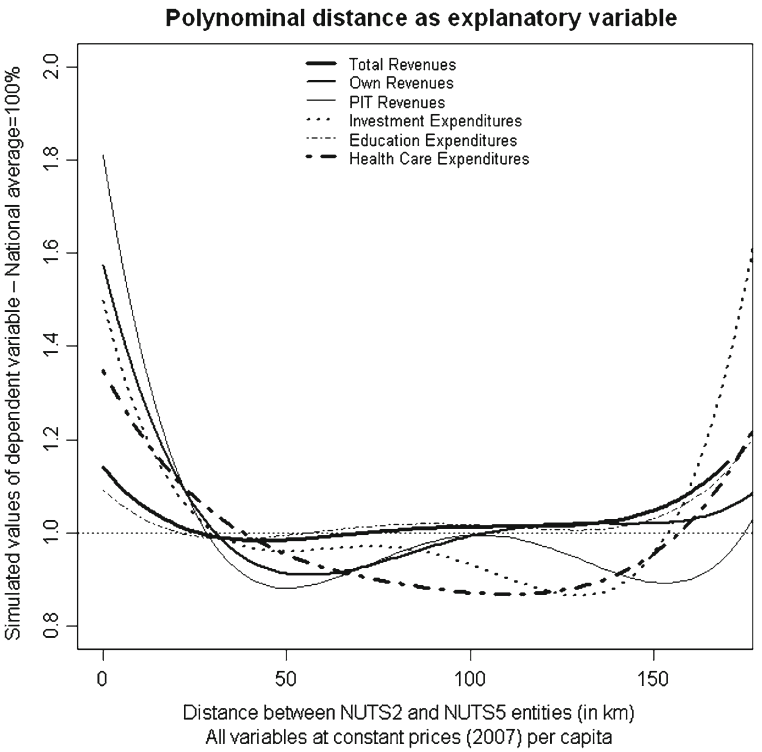

Fig. 5 Simulation of estimated models

the emergence of strongly developing voivodeship capitals and weaker peripheries was observed. The municipalities located more than 25 km away from the voivodeship capital can already be considered peripheries and the distance does not matter–many processes are similar both at a distance of 25 and 100 km from the centre. This spatial pattern indicates that there is no actual NUTS2-wide diffusion from the core towards the peripheries; only core surrounding units benefit from these centrifugal forces. Voivodeship capitals carry out the development process on their own, and the adjacent municipalities benefit from diffusion to a moderate extent. The influence of regional governments and the effect of institutional rent do not go beyond the distance of 25 km from the core.

The presented statistics clearly indicate a process of local divergence. Socioeconomic development and the activities of local governments in the centre are different from those of peripheral municipalities, and municipalities located just 25 km away from the regional centre should be considered peripheries. This proves that the core–periphery model is growing stronger. It should be noted that, before the administrative reform of 1999, location was not so important, especially for municipal budgets; revenues and expenditures *per capita* were similar. The analysis of changes over time shows that the gap is growing, which may lead to a deeper marginalisation of non-central municipalities and to the concentration of socioeconomic activities in large cities.

The above presented analysis leads to the conclusion that the establishment of 16 strong centres in place of 49 weaker centres has caused regional divergence to intensify. The absence of the diffusion process has caused voivodeship capitals to grow in strength at the expense of other local governments. The pre-reform division guaranteed a larger number of urban centres the instruments to stimulate their respective peripheries. Benefits from the institutional rent of smaller centres of power enabled the wider diffusion of development processes within the natural reach of approximately 25 km. Paradoxically, a larger number of weaker voivodeship capitals ensured better institutional settings to promote sustainable development.

The study shows that "invisible hand of market" and hope that decentralisation and self-responsibility will ensure sustainable development is a myth. Natural forces exacerbate divergence process. Having in mind Common Regional Policy seems that an equal opportunity policy (convergence and cohesion) is a must, both for the society and for the economy. The absence of such a policy entails an increasing regional divergence. Also, the expected diffusion mechanism is often imperfect. The policy of investing in "development drivers" may imply the diffusion, but this process requires institutional support in creation transmission channels and incentives. When the infrastructure (as a basis), and economic or social benefits (as catalysts) are lacking, then usually the diffusion mechanism fails leading to the disadvantage of peripheral municipalities.

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